# ON THREE NORTHERN SPECIES OF *HYDRACTINIA*

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(*With Plates 11–12*)

SYNOPSIS

Three species of *Hydractinia*, *H. allmani* Bonnevie, *H. carica* Bergh and *H. monocarpa* Allman from the Arctic are redescribed from numerous colonies. The great differences noted between colonies of the same species are shown to depend on the stage of reproductive exhaustion reached when the colonies were taken. What is known of their biology and distribution is summarized.

## INTRODUCTION

*Hydractinia* is a large genus, and, of the many species which have been described, few have been worked on alive prior to a description being drawn up. In consequence many of the specialists who have worked on these animals (perforce from Expedition material) have seldom considered the specimens before them as having been something alive and constantly changing. Inevitably phases in growth and reproduction as well as ecological forms have on occasion been described as distinct species.

The northern *Hydractinia* species have been partially revised by Broch (1916) and Kramp (1932) so that there is now less confusion about the identity of arctic and subarctic forms. Some species however require redescription based on re-examination of as many colonies as possible in order to eliminate the use of so-called diagnostic features which are due to growth, seasonal variation, reproductive activities or reflect environmental conditions.

In species like *Coryne* where the gonophores are borne directly on the body of the hydranth, these reproductive activities cause the hydranth itself to be resorbed and often reduced to a mere stump without tentacles. This phenomenon may be termed reproductive exhaustion and it is by no means confined to the capitate hydroids where its effects are most noticeable. In *Hydractinia* reproductive exhaustion manifests itself first in the fertile polyps (or special reproductive polyps as the case may be) and also causes some reduction in the size of the nutritive polyps. I first noticed an appreciable reduction in the size of the sterile polyps in a Hydractinid due to this cause in the undescribed hydroid of *Podocoryne borealis*. During the fifteen days I had it under observation, it was producing large numbers of medusae, and by the time I was certain that it was distinct from the better-known *P. carnea*, the colony had altered so much in appearance that I could not honestly describe it in that condition (Rees, 1941).

This paper is confined to observations on three northern species, *Hydractinia allmani* Bonnevie, *Hydractinia carica* Bergh and *Hydractinia monocarpa* Allman, and is based on the rich arctic and subarctic collections of the Naturhistoriska Riksmuseum, Stockholm. Some of the material has been briefly described by Elof Jäderholm, but all the locality records of colonies in the Riksmuseum have been reported by him in various papers.

## ***Hydractinia allmani*** Bonnevie

*Hydractinia allmanii* Bonnevie, 1898, *Z. wiss. Zool.*, **63** : 485, pl. xxvi, figs. 36–37.
Bonnevie, 1899, *Norske Nordhavs Exped.*, 1876–8, **26** : 47, pl. i, fig. 1.
Jäderholm, 1902, *Bih. Svenska Vet. Akad. Handl.* **28**, Afd. 4, No. 12 : 8.
Broch, 1903, *Bergens Mus. Årb.* **1903**, No. 9, Table.
*Hydractinia allmani*, Hartlaub, 1905, *Zool. Jb.* Suppl. **6**, Bd. 3 : 518.
Jäderholm, 1908, *Mém. Acad. Sci. St. Petersb.* (8) **18**, No. 12 : 7, pl. i, fig. 5 ; pl. ii, figs. 2–5.
Jäderholm, 1909, *K. Svenska Vetensk-Akad. Handl.* **45**, No. 1 : 49.
Broch, 1910, *Fauna Arctica*, **5** : 200.
Kühn, 1910, *Zool. Jb.* (*Anat.*), **30** : 107.
Kramp, 1914, *Medd. Grønland*, **23** : 988.
Broch, 1916, *Danish Ingolf Exped.* **5** : 44.
Rylov, 1923, *Annu. Mus. Zool. Acad. St. Petersb.*, **24** : 151.
Kramp, 1943, *Medd. Grønland*, **121**, No. 11 : 8.

Type locality. Norske Nordhavs Expedition 1876–78, St. 137, 67° 24′ N., 8° 58′ E., 827 m. (Zoological Museum, Oslo) Type locality selected here.

Material seen. In Riksmuseum, Stockholm :

Swedish Polar Expedition, 1900.
St. 17, Mackenzie Bay, north of Franz Josef Fjord, E. Greenland, 12–35 m.
St. 23, Mackenzie Bay, north of Franz Josef Fjord, E. Greenland, 3–10 m.
St. 27, Muskoxfjord, Franz Josef Fjord, E. Greenland, 220 m.
Russian Polar Expedition, 1900–1903.
St. 10 *d*, Kara Sea, 73° 27′ N., 79° 15′ E., 40 m.
St. 18, Gulf of Middendorff, 75° 54′ N., 92° 59′ E., 12–14 m.
St. 50, north of New Siberian Isles, 77° 20′ 30″ N., 138° 47′ E., 38 m.
Otto Torell : Bellsund, Spitzbergen, 8–12 fm.

Specific Characters. *Hydractinia* with encrusting base, with few simple, smooth spines. No tentaculozooids or spiral zooids. Nutritive polyps, long columnar (1·4–15·0 mm. high) with up to 16 filiform tentacles. Reproductive polyps (0·75–5·0 mm.) at first with hypostome and at least 8 tentacles becoming reduced to stumps with armed proboscis and even without tentacles. Usually one large and one small gonophore on each reproductive polyp.

Gonophores (0·6—1·4 × 0·5—1·3 mm.). Female, cryptomedusoid with 4 well-developed radial canals and 8 teat-like tentacle rudiments. Eggs numerous, polygonal at first becoming rounded or oval and escaping through a pore between the tentacle rudiments. Male gonophores also cryptomedusoid.

DISTRIBUTION. Apart from two records in rather deep water off the Norwegian coast, viz : position, 67° 24′ N., 8° 58′ W., S.W. of the Lofotens at a depth of 827 m. (Bonnevie, 1899) and position 63° 12′ N., 1° 30′ E., at a depth of 1320 m. (Broch, 1903), *H. allmani* has been found mainly in the high Arctic.

It has been found in the Spitzbergen area on a number of occasions (Bonnevie, 1899 ; Jäderholm, 1909 and Rylov, 1923). To the east the Russian Polar Expedition 1900–1903 took it in the Kara Sea, the Gulf of Middendorff and north of the New Siberian Islands (Jäderholm, 1908). In Greenland it was taken at three stations by the Swedish Polar Expedition, 1900, in the neighbourhood of Franz Josef Fjord (Jäderholm, 1902) and in Kempes Fjord by the Swedish Grönland Expedition, 1899. Other Greenland records from Hurry Fjord (Scoresby Sound area), Kempes Fjord, Vega Sound and the mouth of Forsblad Fjord are given by Kramp (1943).

The absence of records from the Okhotsk Sea and the Bering Sea are possibly due to lack of observations and the species may prove to be circumpolar in distribution.

DESCRIPTION. This is a large and handsome *Hydractinia*, but small and intermediate colonies occur and the species is very variable. For this reason several colonies are described below.

Fully grown colonies before the onset of reproductive exhaustion, as already mentioned above, are large and handsome and the following description is based on a colony from Muskoxfjord, East Greenland (Pl. 11, figs. 3–4). The encrusting base, which is continuous, has few spines, and arising from it are long spindly nutritive polyps reaching a height (to hypostome) of 8·0–13·5 mm. in preserved material. There is a well developed, conical proboscis, which is armed with a few nematocysts, with at its base, a circle of about 15 tentacles in a close double whorl. Each hydranth arises directly from the hydrorhiza and there is no distinct ring of perisarc at this point although the perisarc forms a thin wrinkled sheath.

The largest reproductive hydranths are 1·6–4·5 mm. high, that is, they are only about half the length of the nutritive ones, and from this colony it is not possible to say whether they are derived from nutritive polyps. The largest seen had a length of 4·5 mm.; it had a conical proboscis moderately well armed with nematocysts at its distal end. The tentacles were four in number and only 0·2 mm. in length. Some distance below the head of the hydranth it carried one large and one small gonophore. Other blastostyles ranged down to 1·6 mm. in height and the tentacles were sometimes reduced to mere knobs. Each blastostyle usually carried one large and one rudimentary gonophore. None of the gonophores was fully developed, the largest having a diameter of 1·4 mm. No spiral zooids have been observed.

Both male and female gonophores occur in the same colony. They are cryptomedusoids with well developed radial canals and the tentacle bulb rudiments are represented by four slightly pigmented areas (more mature gonophores are described from the colony taken at Mackenzie Bay, East Greenland on 1st August, 1900).

Another colony from Mackenzie Bay (also East Greenland) has similar gonophores, but the nutritive polyps are either less well developed or retracted (due to preservation methods) (Pl. 11, figs. 1 and 2). The polyps have a height of up to 5 mm. Likewise the gonophores are not fully mature and the blastostyles themselves are quite small being only 1·3–1·5 mm. in total height.

A second colony from Mackenzie Bay taken on 1st August, 1900, has distinctly smaller hydranths, these being less than 3·0 mm. in height, but both male and female gonophores are fully developed. The female gonophore is fully developed at 1·2 mm. in diameter and the tentacular rudiments are represented by 4 - 8 teat-like processes and the manubrium may protrude through the opening by which the eggs escape.

Another colony taken by the Russian Polar Expedition, 1900–1903, St. 50, north of the New Siberian Islands, is remarkable for the length of the nutritive polyps which are up to 14·3 mm. in height. The female gonophores are ripe (Pl. 11, fig. 7) and the male ones nearly so. The blastostyles vary from 1·5 mm. to 3·3 mm. in height and the larger carry 8 tentacles and the smaller ones only 1 or 2. Typically only 2 gonophores, one large and one small, are found on each blastostyle. The ripe female gonophore has 4 perradial rudiments of tentacles and 4 smaller interradial rudiments (Pl. 11, fig. 7).

The individual (both nutritive and reproductive) polyps of a colony from the Kara Sea are small. Some of the female gonophores are sufficiently advanced to show the rudiments of tentacle bulbs and radial canals. Here the blastostyles are more reduced than in some of the other colonies and often only one or two stumps of tentacles are left (Pl. 11, figs. 5 and 6). The proboscis of the reduced blastostyle is well armed with nematocysts. Eggs are numerous at first but become reduced in number to 10–15 in the ripe gonophore.

As will be noticed from Table I there is a considerable range in the size of the nutritive polyps and the very large size of the polyps in two colonies (one from Mackenzie Bay, St. 27 and the other from north of the New Siberian Islands) made me suspect that a different species was involved, but a careful re-examination of the material revealed no essential points of difference in any of the colonies except in size and degree of maturity of the gonophores.

TABLE I.—*Hydractinia allmani* Bonnevie.

(Measurements in mm.)

| | Mackenzie Bay, E. Greenland | | | Gulf of Middendorff, Kara Sea | North of New Siberian Islands |
|---|---|---|---|---|---|
| | St. 17 | St. 23 | St. 27 | | |
| Length of nutritive polyp | 2·4–2·7 | 1·4–3·1 | 7·0–13·5 | 2·0–2·2 | 3·1–12·0 |
| Maximum diameter of polyp | 0·4–0·5 | 0·2–0·4 | 0·5–0·9 | 0·2–0·7 | 0·7–0·9 |
| Length of hypostome | 0·5–0·6 | 0·3–0·4 | 0·6–0·8 | 0·3–0·35 | 0·5–0·8 |
| Height of reproductive polyp | 1·5–1·7 | 1·1–2·9 | 2·3–4·5 | 0·75–1·4 | 1·5–3·3 |
| Length of gonophore | 1·1–1·3 | 0·9–1·1 | 0·6–1·4 | 0·6–1·1 | 1·1–1·4 |
| Diameter of gonophore | 1·0–1·2 | 0·9–1·1 | 0·3–1·3 | 0·5–1·1 | 1·0–1·3 |

In these colonies the nutritive polyps are more than twice the size of the largest reproductive polyps; the latter have up to 8 tentacles and are very similar to the sterile polyps. It is not possible to be completely certain that they are reduced from the nutritive polyps through bearing gonophores, as in *Podocoryne carnea*, but it may be that we have here the beginnings of the specialization which results in the production of the specialized reduced reproductive polyps seen in *Hydractinia echinata*.

In the remaining colonies there is some overlap in the size of the two kinds of polyps, and in view of the small size of all the polyps it appears likely that they are reduced by prolonged breeding. This raises the question of the status of *Hydractinia ornata* Bonnevie, which, as far as I can see, is distinguished from *H. allmani* only on size ; its status must await the re-investigation of the original material.

There is one feature in the reduction of the reproductive polyp which is worth noting. The proboscis of the very reduced polyp is armed with nematocysts, these being concentrated at its tip as the tentacles are resorbed. The use of this character (an armed proboscis) in classification should therefore be used with caution.

Biology. In all records where the substratum of *Hydractinia allmani* has been indicated, the gastropod involved has been *Sipho curtus* (Jeffreys). In the high Arctic the hydroid occurs at depths of 3–760 m. in Greenland, 75–350 m. off Spitzbergen and in 12–40 m. in the more easterly localities.

Records of this species from off the Norwegian coast in comparatively deep water (*see* Distribution) suggest that this submergence is related to temperature. A colony reported by Jäderholm (1909, p. 49) was dredged from 350 m. where the bottom temperature was 2·73° C., while Bonnevie (1899, p. 11) recorded the species from bottoms where the temperatures were — 1° C. and — 1·2° C. Comparable temperatures (given by Ekman, 1953, p. 166) exist at the other localities at which this species has been found.

It is probable that *Hydractinia allmani* can be regarded as a stenothermal cold water species.

Historical and Relationships. Since Bonnevie described the species in 1898, numerous records indicate that this is a common species in the high Arctic. It can be readily distinguished from *Hydractinia monocarpa* and *H. echinata* by its simple smooth spines ; from *Podocoryne* it is separated by its fixed gonophores. Compared with *H. carica*, it is more robust in habit, with longer polyps and more polyp-like reproductive zooids. The numerous eggs in the female gonophores (eggs are few in number in the gonophores of *H. carica*) also help to distinguish it.

### ***Hydractinia carica*** Bergh 1887

*Hydractinia carica* Bergh, 1887, *Lütken, C.F. Dijmphna-Togtets zool.-bot. Ubbytte*, p. 331, pl. xxviii, fig. 1.
Schydlowsky, 1902, *Trav. Soc. Nat. Univ. Kharkow*, **36** : 114.
Hartlaub, 1905, *Zool. Jb. Suppl.*, **6**, Bd. **3** : 518.
Jäderholm, 1908, *Mém. Acad. Sci. St. Petersb.* (8) **18**, No. 12 : 8.
Jäderholm, 1909, *K. Svenska Vetens.-Akad. Handl.*, **45**, No. 1 : p. 48, pl. ii, figs. 10 and 11.
Broch, 1910, *Fauna Arctica*, **5** : 200.
Broch, 1916, *Danish Ingolf Expedition*, **5**, Part 6 : 48, pl. i, fig. 11.
Scheuring, 1922, *Wiss. Meeresuntersuch. Abt. Helgoland*, **13** : p. 168.
Rylov, 1923, *Annu. Mus. Zool. Acad. St. Peterb.*, **24** : 150, Taf. vi, figs. 2–3.
Fraser, 1931, *Contr. Canad. Biol.*, N.S., **6** : 6.
Uschakow, 1937, *Trans. Arct. Inst. Leningr.* **50** : 12.
Fraser, 1944, *Hydroids Atlant. Coast N. America*, p. 77, pl. xiii, fig. 53.

*Hydractinia minuta* Bonnevie, 1898, *Z. wiss. Zool.*, **63** : 468, pl. xxvi, fig. 38.
Bonnevie, 1899, *Norske Nordhavs Exped.* 1876–8, **26**, Zool. : 47 pl. i, fig. 3.
Bonnevie, 1901, *Meeresfauna von Bergen. Hydr.*, **1** : 7.
Broch, 1910, *Fauna Arctica*, **5** : p. 141 and 200.

TYPE LOCALITY. Petuchoffskoi Schar, Kara Sea, 15 m. (*Dijmphna Expedition*—Zoological Museum, Copenhagen).

MATERIAL SEEN. In Riksmuseum, Stockholm :

Fragment of type material on a mounted slide.

Bellsund, Spitzbergen, 20 fm. 22nd July, 1864 (A. J. Malmgren)
Bellsund, Spitzbergen, 8–12 fm. (Otto Torrell)
Recherche Bay, Spitzbergen, 13th July, 1898 (Spitzbergen Expedition, 1898) 67° 56′ N., 66° 18′ W., 13th October, 1897 (E. Nilsson)
Russian Polar Expedition, 1900–1903, St. 3, Murman Sea, 69° 35′ N., 50° 5′ E.; 70 m.

In British Museum :

Klaas Billen Bay, Spitzbergen, 28th July, 1921, C. S. Elton (Oxford Univ. Exped. to Spitzbergen, 1921).

SPECIFIC CHARACTERS. *Hydractinia* with encrusting base with few high conical smooth spines (up to 0·7 mm. high) with rounded apices. Nutritive polyps, small, up to 2·3 mm. high when fixed, with a single whorl of 10–16 tentacles. Proboscis simple, almost unarmed. No spiral zooids known.

Reproductive polyps up to 2·3 mm. high, at first with conical hypostome and at least 8 tentacles, becoming greatly reduced to very short stumps without tentacles ; proboscis armed with nematocysts when present. Gonophores 3–7 in number borne in a ring round the polyp.

Gonophores cryptomedusoid, with 4 radial canals and rudiments of tentacles present but not developed into bulbs. Eggs large, 4–10 in number.

DISTRIBUTION. *Hydractinia carica* is known from the Kara Sea (Bergh, 1887), the Barents Sea (Jäderholm, 1908 ; Scheuring, 1922), Spitzbergen, the Davis Strait area (West Greenland) and on the Norwegian coast in the neighbourhood of Bergen.

There are numerous records of this species from Spitzbergen, most of these being summarized by Jäderholm (1909) and Rylov (1923). I have been able to verify Jäderholm's record (1908) from Davis Strait and there are others by Fraser (1931 and 1944 as *carica* and *minuta*) from approximately the same area. The most southerly record is that of Bonnevie (1901) from the Hjeltefjord, Bergen as *H. minuta*.

There is insufficient information to hazard any opinion as to whether this species has a circumpolar distribution.

DESCRIPTION. This is an encrusting species with large spines but without small prickles. The large spines are simple, smooth and not sharply pointed ; they have no pore at the tip and in size range up to 0·7 mm. in length.

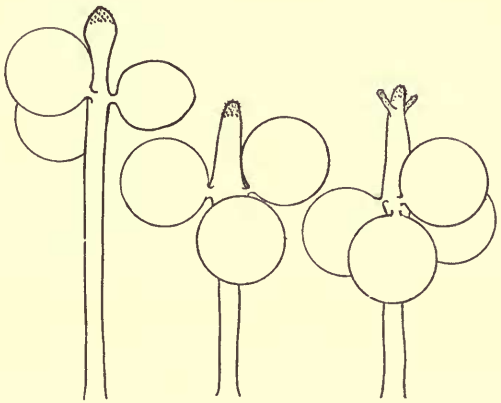
In preserved material the hydranths are tubular to fusiform in shape and may be over 2·0 mm. in height. The head of the hydranth is sometimes clavate and there is a

conical proboscis without many nematocysts around the mouth. There are usually about 16 tentacles arranged more or less in a single whorl.

The reproductive polyps vary considerably from colony to colony according to the stage they had reached when taken, and it has been deemed desirable to describe them in the different colonies.

In the colony from Bellsund, Spitzbergen the reproductive polyps are completely reduced to very short stumps 0·17 mm. or less in length, bearing up to 5 gonophores each. These have diameters of about 0·45 mm. Sterile hydranths are 1·3–2·0 mm. in length.

Another colony from Recherche Bay, Spitzbergen, does not appear to have reached the same state of reproductive exhaustion as the one from Bellsund. In this colony the fertile polyps are still recognizable as polyps ; one of these still possessed 8 fully developed tentacles and a distinct proboscis and carried 5 moderately developed gonophores. Another reproductive polyp, with a height of 0·9 mm., had 7–8 tentacles and 4 gonophores each with a diameter of 0·3 mm.



Text-fig. 1.—*Hydractinia carica* Bergh : blastostyles from a colony from Recherche Bay, Spitzbergen (Swedish Spitzbergen Expedition, 1898).

A colony from position 67° 56′ N., 66° 18′ W., had particularly large blastostyles, 1·0–2·3 mm. in height to hypostome. These had 3–5 gonophores each and only a few had up to 2 reduced tentacles. The hypostome was usually well armed with nematocysts.

There were only a few very reduced polyps. These were so short that they could not be measured accurately ; they carried 5–7 gonophores and were clearly reaching the exhaustion stage.

Colonies from the Murmansk coast and Bellsund, Spitzbergen, were fertile and some of the reproductive polyps of these possessed 2 or more tentacles.

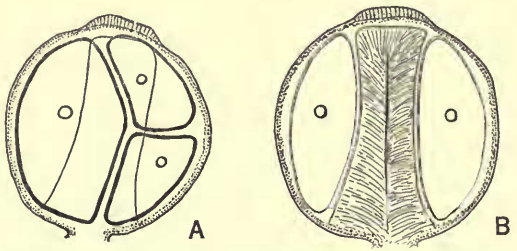
A mounted slide marked *Orig. Ex.*, Dijmphna Exp. presented by Levinsen appears to consist of part of the type material of this species. Measurements of this and other colonies in the Riksmuseum are given in Table II. Some of the reproductive polyps carry about 4 tentacles and others have lost them (Text-fig. 1).

TABLE II.—*Hydractinia carica* Bergh

(Measurements in mm.)

| | Kara Sea (fragment of type material) | 67° 56′ N., 66° 18′ W. | Bell Sound, Spitzbergen |
|---|---|---|---|
| Length of polyp | 1·5–1·7 | 1·0–2·3 | 1·0–2·0 |
| Maximum diameter of polyp | 0·3–0·4 | 0·1–0·2 | 0·2–0·3 |
| Length of hypostome | 0·4 | 0·2 | 0·1–0·3 |
| Height of reproductive polyp | 0·75–0·9 | 0·1–2·3 | 0·17–0·2 |
| Length of gonophore | 0·28–0·4 | 0·3–0·4 | 0·45 |
| Diameter of gonophore | 0·25–0·4 | 0·3–0·4 | 0·45 |
| Length of spine | — | — | 0·37–0·7 |

Only female gonophores have been noted in this material; they are cryptomedusoids without radial canals but with apical patches of nematocysts. There is a well-developed manubrium and when ripe the gonophores contain 4–10 large eggs each (Text-fig. 2, *a*, *b*).




Text-fig. 2.—*Hydractinia carica* Bergh; gonophores from a fragment of the type colony, Kara Sea (Dijmphna Expedition): *a*, female gonophore; *b*, another female gonophore in optical section.

This material agrees with the earlier descriptions of Bergh (1887), Jäderholm (1908) and Broch (1916), but it has been possible to get a better picture of the species as a whole. The nutritive polyps (in preserved material) are seldom more than 2·0 mm. in height and it is possible that the reproductive polyps are derived directly from them. Bergh and the other authors indicated that the reproductive polyps might have 1–4 tentacles, but I have found 8 which supports my suggestion. Jäderholm (1909, pl. ii, figs. 10 and 11) gives good illustrations of partially reduced hydranths, and others are figured here (Fig. 1), but they may become so short that even the hypostome is almost completely reduced and the stalk below the point of origin of the gonophores also becomes extremely short. Broch (1916, p. 48) is undoubtedly right in his contention that Bonnevie's *H. minuta* (Bonnevie, 1899, p. 48) is identical with *H. carica*. I regard the colony she described as being in an advanced stage of reproductive exhaustion.

BIOLOGY. This species favours the shells of various northern species of *Buccinum* as a substratum. In the Barents Sea it has been found on *Buccinum undatum* and *B. tenue*. In the Spitzbergen area Jäderholm (1909) has found it on *Buccinum glaciale* and *Trophon clathrus*, while Rylov (1923) reported it as *H. minuta* on *Buccinum ovum* and *B. ciliatum*.

The bathymetric range appears to be 0–120 m. in the Spitzbergen area and 40–70 m. in the Barents Sea.

*Hydractinia carica* may be regarded as mainly a cold water species which, if Bonnevie's record from Bergen is authentic, is probably less stenothermal than *H. allmani*.

HISTORICAL AND RELATIONSHIPS. *Hydractinia carica* was described by Bergh (1887) from Petuchoffskoi Schar in the Kara Sea from a depth of 15 metres. Subsequently it was recorded many times in the far north and as *H. minuta* Bonnevie from Spitzbergen and elsewhere. As a species it is distinguished from other northern *Hydractinia* by its simple smooth spines, the extreme reduction which takes place in its reproductive polyps and by its gonophores. These have no radial canals and the female ones have few eggs.

### ***Hydractinia monocarpa*** Allman

*Hydractinia monocarpa* Allman, 1874, *Nature, Lond.* **11**, No. 270 : 179.
Marktanner, 1895, *Zool. Jb.* (*Syst.*), **8** : 394.
Schydlowsky, 1902, *Trav. Soc. nat. Univ. Kharkow*, **36** : 114.
Hartlaub, 1905, *Zool. Jb. Suppl.* **6**, Bd. 3 : 518.
Jäderholm, 1908, *Mém. Acad. Sci. St. Petersb.* (8), *Cl. Phys.-Math.* **18**, No. 12 : 8, Taf. 1, fig. 6, Taf. 2, figs. 6–9.
Jäderholm, 1909, *K. Svenska Vetens.-Akad. Handl.* **45**, No. 1 : 49, Taf. ii, figs. 12–13.
Broch, 1910, *Fauna Arctica*, **5** : 141.
Broch, 1916, *Danish Ingolf Exped.* **5**, Pt. 6 : 47.
Rylov, 1923, *Annu. Mus. Zool. Acad. St. Petersb.* **24** : 148, Taf. VI, fig. 7.
Kramp, 1932, *Medd. Grønland*, **79**, No. 1 : 16.
Uschakow, 1937, *Trans. Arct. Inst. Leningr.*, **50** : 12.
Fraser, 1944, *Hydroids Atlantic Coast N. America*, p. 77.

*Hydractinia echinata*, Winther, 1880, *Naturh. Tidsskr.* **12** : 227, 254.
Levinsen, 1893, *Vidensk. Medd. naturh. Foren København*, 1892, p. 153.

TYPE LOCALITY. Spitzbergen, on *Trophon clathratus* L. (Allman, 1876) (Zoological Museum, Copenhagen)

MATERIAL SEEN. In Riksmuseum, Stockholm :

Matotschkim Schar, 15 fm. (Novaya Zemlya Expedition, 1875).
Russian Polar Expedition, 1900–1903, St. 53, 77° 10′ N., 142° 48′ E. (N. of New Siberian Isles) 35 m., on *Trophon clathratus* and *Bela plicifera*.

SPECIFIC CHARACTERS. *Hydractinia* with encrusting base with long, often irregular, hollow spines which may bifurcate distally. Spines longitudinally keeled especially at base, but smooth and not thorned, up to 2·4 mm. high. Nutritive polyps fusiform to tubular, up to 3·6 mm. high, borne on the encrusting base or on the sides of the spines. Tentacles, 10–15. Spiral zooids not known.

Reproductive polyps, up to 1·5 mm. high, with armed proboscis and at least 4 tentacles, or may be reduced without tentacles and greatly shortened. Gonophores 1–4 on each, but usually only one.

Gonophores : female, up to 1·4 mm. in diameter ; cryptomedusoid with 4 radial canals and apical patch of tissue. Male gonophores similar, up to 0·55–0·6 mm. in diameter.

Distribution. All records of this species are from the high Arctic, chiefly from Spitzbergen, Novaya Zemlya and the New Siberian Isles. It appears to be a common species on shells at Spitzbergen (Allman, 1876 ; Jäderholm, 1909 and 1916 ; and Broch, 1910). The Russian Polar Expedition 1900–1903 took it at two stations off the New Siberian Islands and in Chatanga Bay in Nordenskjold's Sea (Jäderholm, 1908). Records from Novaya Zemlya are given by Jäderholm (1909).

West Greenland records from Upernivik and from near Cape Atholl are given by Kramp (1932). This distribution suggests that the species is circumpolar.

Description. This species has an encrusting base, but the most characteristic feature is the presence of long, upright irregularly-formed spines rising to a height of about 3 mm. (Pl. 12, figs. 8–11). The spines are seldom straight or symmetrical and are usually curved towards the tip which tapers to an open hyaline or horn-coloured tube. Frequently the spines are double or bifurcated and their surface is seldom smooth. The naked coenosarc may cover a good part of the spines.

The nutritive hydranths may be long and tubular reaching (when expanded) a considerable length. Some preserved examples, moderately well fixed, have a length of 3·6 mm., but, when contracted, may only be one-third or less than this length. Such retracted polyps are either cylindrical or flask-shaped (Pl. 12, figs. 9 and 10). The hypostome carries nematocysts, particularly near the tip, but they are few in number. There are 10–14 tentacles. A curious feature of this species is that one or more polyps may be carried on the spines themselves and I have seen up to three on one spine (Pl. 12, figs. 9 and 10).

The reproductive polyps, noted in the material seen, were up to 1·5 mm. in height and were provided with up to 4 tentacles. Each had an armed tip to the proboscis and carried up to 4 gonophores. Only female gonophores have been noted by me ; these are large, 0·5–0·7 mm. in diameter and are cryptomedusoids with manubrium and radial canals. It is clear that the blastostyles become considerably reduced due to reproductive exhaustion. Frequently they are reduced so much that the gonophores appears to be almost sessile on the coenosarc. When this happens the upper part of the polyp seems to become larger and more polypoid, but the stalk below the point of origin of the gonophore is extremely short.

In his original description Allman (1874) described the reproductive polyps as devoid of tentacles, but tentacles have been noted by Jäderholm (1908). Rylov (1923), Kramp (1932) and by myself. The diagnosis of the species (p. 25) differs greatly from that of Allman because more colonies have been available for study.

Biology. *Hydractinia monocarpa* has been found on the shells of gastropods such as *Trophon clathrus*, *Bela plicifera* and *Buccinum hydrophanum* (Jäderholm, 1908, 1916, and Kramp, 1932). The hydroid may grow all over the shell as in a specimen of *Bela plicifera* from Kol Bay, Isfjord, Spitzbergen. The nutritive and reproductive polyps flourish best in and near the sutures between whorls, but they also occur on exposed surfaces and are absent only on abraded surfaces of the shell. The tall spines are fairly closely grouped and must offer some protection to the zooids.

The species has a known bathymetric range of 14–165 metres, the deepest record being from West Greenland (Kramp, 1932). Most of the records from Spitzbergen and elsewhere in the Polar Sea are, however, from shallow coastal waters.

*Hydractinia monocarpa* may be regarded as a high Arctic or stenothermal cold water species.

HISTORICAL AND RELATIONSHIPS. *Hydractinia monocarpa* was described by Allman from a colony labelled " Spitzbergen " in the Zoologiske Museum, Copenhagen. It has since been found frequently in the Spitzbergen area and elsewhere in the high Arctic.

This distinctive species, with its long, hollow, often bifurcated spines, its polyps arising from both encrusting base and spines, its cryptomedusoid gonophores, with four radial canals but without tentacle rudiments, cannot be mistaken for any other northern species.

The presence of hydranths on the spines recalls the much greater development of this feature in *Hydrissa sodalis* (Stimpson) from East Asiatic seas.

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## DISCUSSION

Colonies of *Hydractinia allmani* show marked variation according to the stage of reproductive exhaustion reached at time of capture and it has been suggested here that the reproductive polyps in this species are derived from nutritive ones. The great variation in the size of nutritive polyps and in the reproductive polyps (from well formed ones to almost blastostyles) is highly significant, and implies that we must use these features with great caution in distinguishing species. It brings to mind the very large number of boreal and tropical species of *Hydractinia* which have been described on single colonies. A critical study of these must result in a great reduction in the number of recognizable species. Another feature, noted in this paper, is the concentration of nematocysts in the tip of the hypostome as the tentacles are resorbed during reduction of the polyp. It means that the armed proboscis, too, must be used with discretion as a diagnostic character.

The study of *Hydractinia carica* also bears out the general conclusions noted above, but this species is notable for the almost complete resorption of the reproductive polyp and shortening of its stem, so that the gonophores sometimes give the appearance of being sessile on the hydrorhiza and even the hypostome may disappear. This, too, is a factor to be considered in classification.

Although *H. monocarpa* can be readily distinguished by its spines, its reproductive polyps vary according to phase and bear out the general conclusions reached for the other two species.

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## PLATE 11

*Hydractinia allmani* Bonnevie

Figs. 1 and 2.—Fragments of a colony from St. 23, Mackenzie Bay, East Greenland (Swedish Zoological Polar Expedition, 1900) ; × 10.

Figs. 3 and 4.—Fragments of a colony from St. 27, Muskoxfjord, Franz Josef Fjord (Swedish Zoological Polar Expedition, 1900) ; × 5.

Figs. 5 and 6.—Reproductive zooids with female gonophores ; St. 18, Karahavet, Middendorff's Sea (Russian Polar Expedition, 1900–1903) ; × 25.

Fig. 7.—Reproductive zooid with ripe female gonophore ; St. 50, north of New Siberian Islands (Russian Polar Expedition, 1900–1903) ; × 14.